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Results of U.S.-U.S.S.R. Joint Marine Mammal Research Cruise in the Kuril and Aleutian Islands 6 June-24 July 1989

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Richard L. Merrick[1]
Mikhael K. Maminov[2]
Jason D. Baker[1]
Alexander G. Makhnyr[2]

[1]National Marine Mammal Laboratory
Alaska Fisheries Science Center
National Marine Fisheries Service
National Oceanic and Atmospheric Administration
7600 Sand Point Way NE
Seattle, WA 98115-0070

[2]Pacific Scientific Research Institute
of Marine Fisheries and Oceanography
Shevchenko Alleye, 4
Vladivostok, U.S.S.R. 107140

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ABSTRACT

As part of the U.S.-U.S.S.R. Agreement on Cooperation in the Field of Environmental Protection, U.S. and Soviet biologists conducted surveys for northern sea lions (Eumetopias jubatus) and other species of marine mammals and birds in the Kuril and Aleutian Islands from 6 June to 24 July 1989. These surveys indicated that previously established declines in sea lion abundance have continued in both areas. Kuril Island pup numbers have declined by 26% since 1983, while pup numbers at Seguam and Bogoslof Islands have declined 79 and 66%, respectively, since 1985.

Twelve of the Kuril Islands were surveyed for northern sea lions and 3,215 adults and juveniles and 1,479 pups were seen on land. In addition, 692 sea otters (Enhydra lutris, including 149 pups), 360 harbor seals (Phoca vitulina, 16 pups), and 78 spotted seals (Phoca largha) were seen. Surveys in the Aleutian Islands at Kiska, Seguam, and Bogoslof Islands found 3,467 adult and juvenile sea lions and 1,497 pups. Also seen were 130 harbor seals (13 pups), 442 otters (89 pups), and 719 northern fur seals (99 pups).

Northern sea lion pups (739) were flipper tagged and branded in the Kuril Islands. Ten adult female northern sea lions were anesthetized, with radio tags applied to five.

Tissue samples were collected for disease and contaminant studies from 18 animals (7 sea otters, 8 sea lions, 1 northern fur seal, 1 harbor seal, 1 spotted seal).

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INTRODUCTION

Background

At the 1988 meeting of the scientific committee for the U.S.-U.S.S.R. Agreement on Cooperation in the Field of Environmental Protection, Area V: Protection of Nature and Organization of Preserves, Project 6: Marine Mammals, U.S. and Soviet scientists agreed that the rapid decline of the northern sea lion (Eumetopias jubatus) population warranted immediate attention by both countries. Furthermore, it was understood that cooperative efforts would produce more efficient research efforts because the two nations, scientists could share technical skills and would have a better understanding of data collected. To these ends, it was agreed that a cooperative, rangewide survey of northern sea lion abundance was necessary in the North Pacific Ocean. As part of this agreement, two U.S. scientists from the National Marine Mammal Laboratory (NMML) were invited to participate in Soviet sea lion surveys and pup tagging during the summer of 1989 in the Kuril Islands.

Cruise Objectives

The primary purpose of this study was to count northern sea lion adults, juveniles, and pups at Kuril and Aleutian Island rookery and haul-out sites (Fig. 1). Secondary objectives included:

1. Weigh, tag, and brand northern sea lion neonates at Kuril Island rookeries.
2. Collect adult and juvenile sea lions at the Kuril

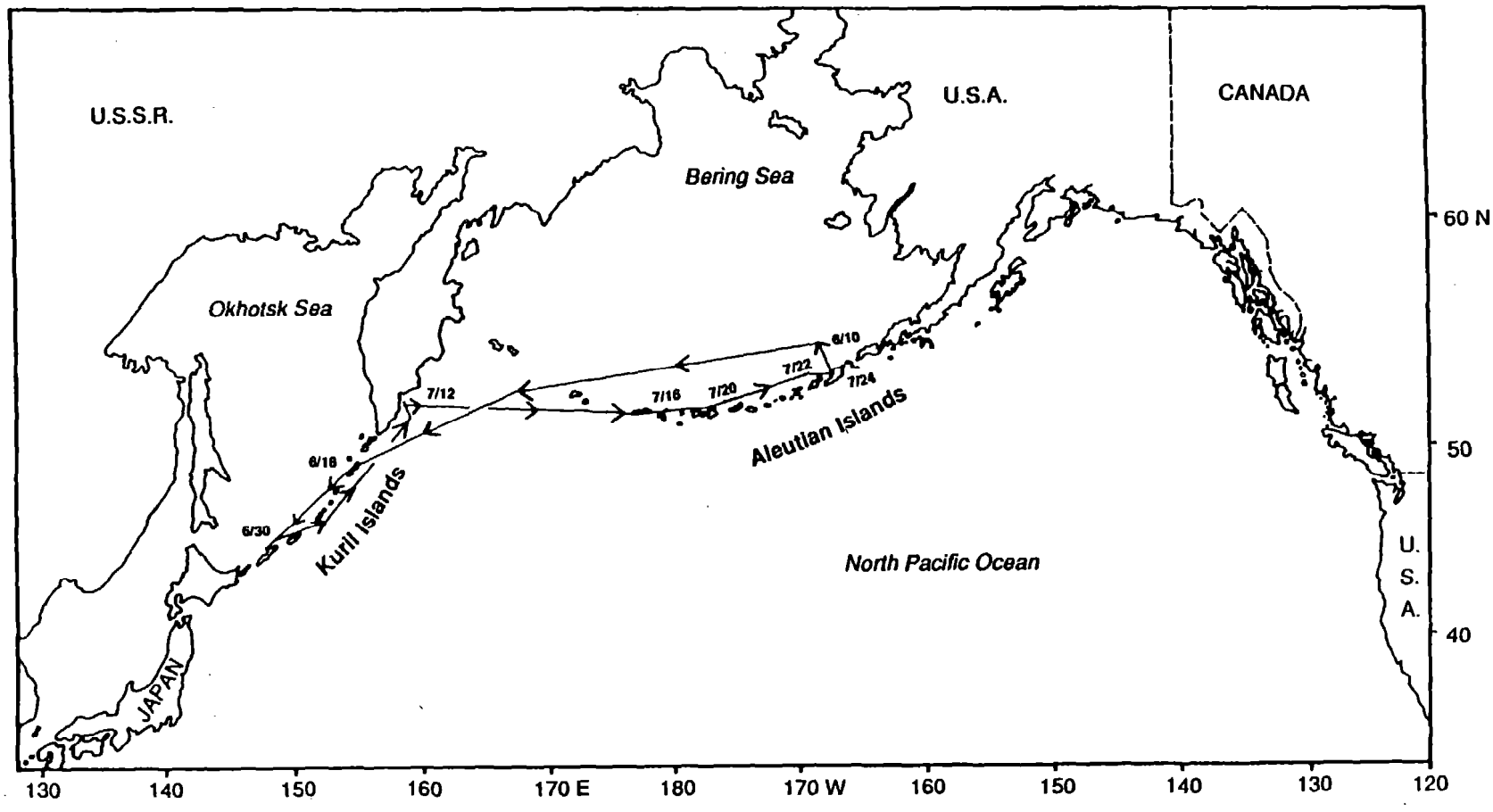

Figure 1.--Generalized cruise track from summer 1989 Rubezhnoe cruise.

Islands for disease, pollutant, and food habit studies.

3. Attach satellite and VHF transmitters to anesthetized, postpartum female sea lions at either the Aleutian or Kuril Islands.
4. Count adult and juvenile northern fur seals (Callorhinus ursinus) at Bogoslof Island.
5. Count harbor seals (Phoca vitulina), spotted seals (P. largha), and sea otters (Enhydra lutris) at Seguam, Kiska, and Kuril Islands.
6. Collect scats and spewings at U.S. sites.
7. Collect any marine mammal skulls, land mammal carcasses or skulls, and bird carcasses found at landing sites.
8. Record sightings of marine mammals and seabirds while in transit and of land mammals and birds while at the Kuril Islands, and record locations of bird colonies in the Kuril Islands.
9. Record entangled animals as seen at sea and on land.

Information obtained in pursuit of these objectives is described on the following pages.

METHODS

Surveys

Sea Lions

Protocol at the rookeries was to count adult and juvenile animals from a small boat (either the ship's 6-m power dory or a

4.7-m inflatable Zodiac[1] raft supplied by NMML) or from land while slowly moving through the rookery. Adults and juveniles were then herded off the rookery, and the pups were counted. Haul-outs were typically counted from a small boat.

At least two independent counts were made at each Kuril Island site, with the average being used as the final count. Counts at Kiska, Seguam, and Bogoslof Islands were performed in a fashion similar to the Kuril Islands work, except that three independent pups counts were obtained at all rookeries to allow calculation of standard deviations.

Other Marine Mammal and Seabird Surveys

Two types of mammal and bird surveys were performed during the study. The first involved small boat circumnavigations of islands in either the ship's dory or in a Zodiac navigated at slow speed at a distance between 100 m and 1 km from shore. Circumnavigation was rarely completed (either due to lack of time or bad weather). As a result, most surveys were performed by island sections (Appendix Table 1). Four to six observers searched for marine mammals, including sea otters, harbor and spotted seals, fur seals, sea lions, and cetaceans. Both land and water were searched. Birds and their nesting activity were also recorded. Where appropriate, 7- or 10-power binoculars were used for identification and searches.

The second type of survey occurred while the ship was in

[1] Reference to trade names does not imply endorsement by the National Marine Fisheries Service, NOAA.

transit. During these times, a continuous marine mammal watch was kept during daylight hours 'by the bridge crew and scientists. Animals sighted were recorded by species, number, date, time, location, and weather.

Entangled Marine Mammals

A watch was kept for entangled animals as part of all other surveys. Those animals seen were classified by species and sex, and where possible the type of entangling debris, size of wound, and the condition of the animal were recorded.

Branding and Tagging

Pups were marked by methods developed by NMML scientists in previous work at Ugamak and Marmot Islands (Merrick et al. 1988; Merrick et al. in prep). Pups were tagged at the four principal Kuril Island rookeries using color- and letter-coded Allflex double-medium cattle ear tags, attached to each pup's left and right foreflipper. The- following colors, codes, and numbers were used:

1. Lovushki - color purple, letter "L"
2. Raykoke - color blue, letter "R"
3. Srednego - color orange, letter "S"
4. Brat Chirpoyev - color green, letter "B"

Each animal's two tags had the same number.

Pups were branded on the right shoulder with the same letter (Cyrillic rather than Roman) and number as on the flipper tags. Note that the 200th animal at each site had only-brands, because

those tags had been reserved as examples.

Radiotelemetry

In our original cruise plan we had proposed to attach radio transmitters to female sea lions in the Aleutian Islands. However, our-request to the U.S. Department of State for entry of the ship into U.S. water was approved too late, and we were not able to perform this work in the Aleutian Islands. The Soviets agreed to allow us to perform the work in the Kuril Islands and suggested two sites--the Lovushki (Dolgaya Rock) and Brat Chirpoyev Islands. Dolgaya Rock was recommended because it was surrounded by deep water, while Brat Chirpoyev was surrounded on three sides by shelf and by deep water to the north. Thus, we would be able to observe a range of foraging behavior. B r a t Chirpoyev was an especially desirable site because (unlike Dolgaya Rock) it is easy to access in almost all weather and, if necessary, a camp could be set up on land. The plan for Dolgaya Rock was to deploy VHF transmitters on four to five animals, a data collection computer (DCC) to record attendance behavior, and one combination of satellite tag and time depth recorder (TDR). The same deployments would occur at Brat Chirpoyev except that we would put out three satellite tags and TDRs.

Adult postpartum female sea lions were to be anesthetized using Telazol by methods described in Loughlin and Spraker (1989). Instruments would then be attached to the animal's back using fast-setting epoxy.

Collections

Marine Mammals

The Soviet government had granted us permission to collect up to 20 sea lions, as well as fur, spotted, and harbor seals and sea otters for analysis of disease, pollutants, and food habits. Tissues for disease and pollutant analysis would be collected and returned to the U.S. for analysis by NMFS and U.S. Fish and Wildlife Service laboratories. The following tissues were to be collected:

1. From all animals--liver, kidney, blubber/skin, muscle, and bile were to be sampled and the tissue frozen. Ovaries were to be preserved in 10% formalin.
2. From the first five sea lions, otters, harbor seals, spotted seals, and fur seals--liver, kidney, blubber/skin, lung, heart, spleen, gonad, eye, cervical lymph node, bone, thyroid, stomach, small intestine, large intestine, urinary tract, gall bladder, pancreas, and mammary tissue were to be collected and preserved in 10% formalin. Blood smears were to be made for any of these animals with sufficient fresh blood.
3. For any remaining animals--liver, kidney, blubber, lung, heart and spleen tissue were to be collected and preserved in 10% formalin.

Weight and standard length were to be measured for each animal. Teeth were to be collected for ageing. Stomachs and colons of all pinnipeds were to be examined for contents. Any hard parts

found were to be preserved for future identification.

Seabirds

Any seabirds found dead on the beach, at sea, or on the ship were to be collected and frozen for study by the U.S. Fish and Wildlife Service and other groups.

Marine Fish

Crewman occasionally caught fish in Soviet waters. Otoliths were collected from up to five specimens of each species caught. Standard length, and location of capture were recorded.

Place names used are as in Sailing directions (enroute) for the east coast of the U.S.S.R. (Defense Mapping Agency 1972).

RESULTS

Cruise Itinerary

Two NMML scientists met the Soviet research vessel, Rubezhnoe, on 7 June in Dutch Harbor, Alaska. Built in 1975, the Rubezhnoe is a 54-m side trawler modified for marine mammal research. It carries two 6-m power dories for collections and surveys. Apparently, it is the only marine mammal research vessel operated for the Pacific Scientific Research Institute of Marine Fisheries and Oceanography (TINRO) Vladivostok laboratory. The vessel had a crew of 28, which included three scientists (M. K. Maminov, A. G. Makhnyr, and S. Makarenko, a hydrologist).

The ship departed Dutch Harbor on 9 June. The ship first headed north into the Bering Sea for a rendezvous with the Soviet research vessel Mys Babushkina. The Rubezhnoe then proceeded to

the Kuril Islands (Figs. 1 and 2, Appendix Table 2). We entered the Soviet Exclusive Economic Zone on 15 June and made our first stop at Shiashkotan Island on 18 June. This stop was to inform coastal watch personnel of our presence and intentions.

The vessel then proceeded south to the Lovushki Islands to begin work on the joint sea lion research program. Between 19 and 25 June we counted northern sea lion adults, juveniles and pups at Lovushki, Srednego, Brat Chirpoyev, and Raykoke Islands. We also branded and tagged sea lion pups at each of the four rookeries. We radio tagged adult female sea lions at Lovushki and Brat Chirpoyev Islands.

On 28 June we began collecting marine mammals, surveying sea lion haul-outs, and performing sea otter studies. Between 28 June and 11 July we collected 17 animals by shooting, and salvaged materials (e.g., skulls) from 11 others found dead on land or in the water. Sea otter work included surveys as well as capture and tagging of otter pups in a test of the utility of inflatable rafts (Zodiacs) for this work. Pinniped, otter, and seabird surveys continued through 11 July.

On 12 July we departed the Kuril Islands for the Aleutian Islands, though we first refueled from the Mys Babushkina and took on water at Cape Rossiya, Kamchatka. We arrived at Kiska Island on 16 July. Pinniped and sea otter surveys were conducted 16-17 July along the west side of the island from Cape St. Stephens north to Concord Point. We left Kiska Island on 17 July

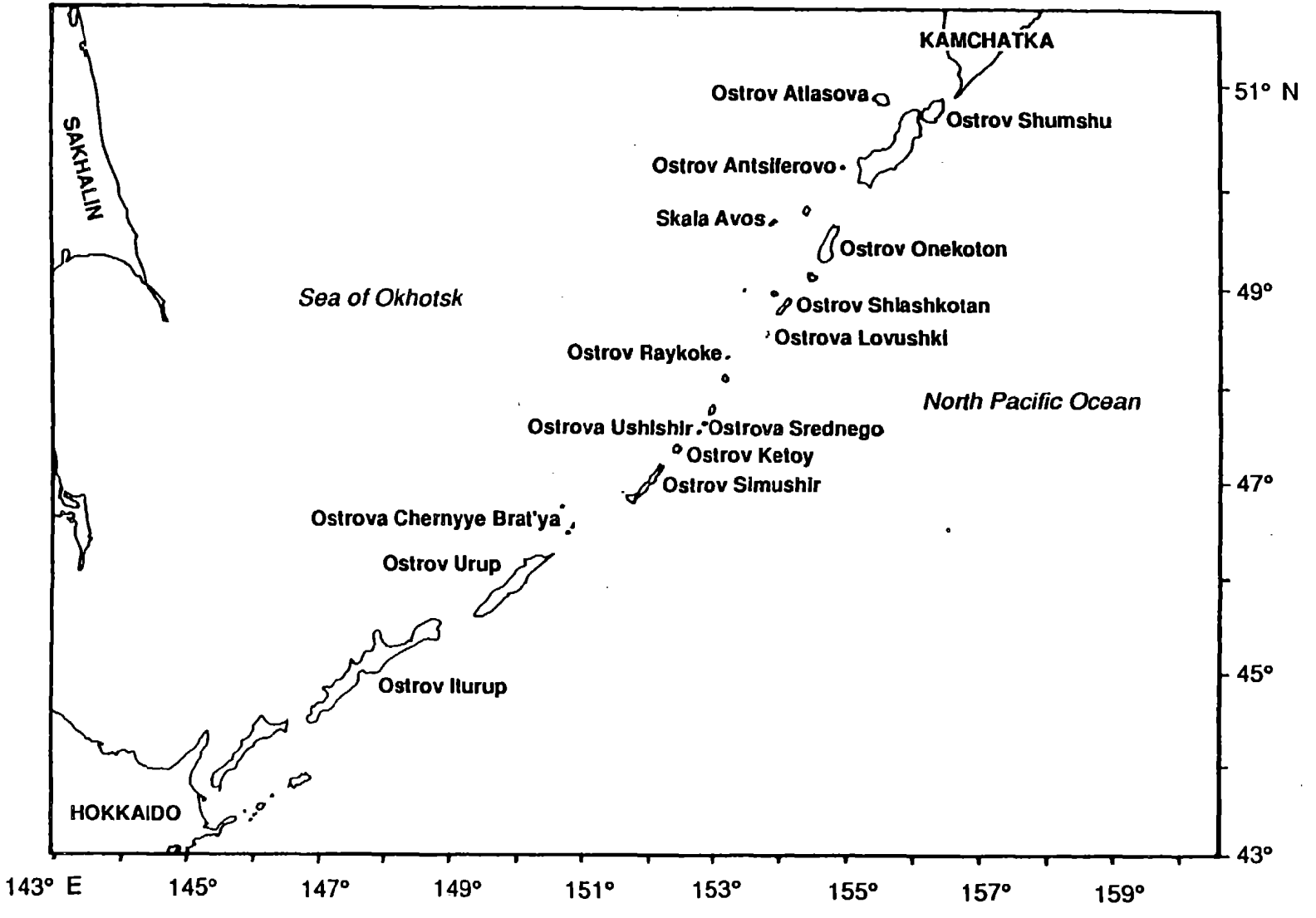

Figure 2.--Locations of Kuril Islands surveyed during summer 1989 Rubezhnoe cruise.

and arrived at Seguam Island on 18 July. Surveys and a circumnavigation of the island were conducted there on 18-19 July. Our final work was conducted at Bogoslof Island, where we surveyed sea lions and fur seals on 22 July.

We departed Bogoslof Island on the evening of 23 July, and arrived in Dutch Harbor at 0800 on 24 July.

Surveys

Sea Lions

Sea lion surveys were conducted between 19 June and 11 July at 12 of the 21 Kuril Islands known to have sea lion hauling sites. This included all five major rookeries (Dolgaya Rock, Raykoke, Khitraya Rock, Brat Chirpoyev, and Antsiferova) and the seven major haul-outs (of 20 known locations). We saw 656 adult, territorial sized males, 2,959 other adults and juveniles, and 1,479 pups at the 12 sites (Tables 1 and 2; Appendix Table 3).

We observed 1,540, 1,153, and 780 adult and juvenile sea lions at Kiska, Seguam and Bogoslof Islands, respectively (Tables 3-4; Appendix Tables 4-5). Numbers of pups (living and dead) were 559, 556, and 381 at the three islands, respectively. Very few juveniles were seen at any site (Tables 2 and 4).

Other Pinnipeds, Sea Otters, and Cetaceans

During small boat surveys conducted at 12 of the Kuril Islands (Table 5), we observed 692 sea otters (including 149 pups), 360 harbor seals (including at least 16 pups), and 78 spotted seals. Surveys conducted at Kiska, Seguam, and Bogoslof

Table 1. --Mean counts of Kuril Island northern sea lions by site and sex-age category from summer 1989 Rubezhnoe cruise.

Location	Date	Survey type[1]	Site type[2]	Adult male	Other adult and juv.	Pups	
						Alive	Dead
Lovushki	6/19	S	R	190	570	372	9
Raykoke	6/21	S	R	77	189	157	5
Srednego	6/22	S	R	111	455	426	7
Brat Chirpoyev	6/24	S/B	R	103	482	267	9
Iturup	6/28	B	HO	7	115	0	0
Simushir	7/02	B	HO	14	96	1	0
Ketoy	7/03-04	B	HO	14	202	2	0
Shiashkotan	7/07	S/B	HO	21	300	0	0
Antsiferova	7/10	S/B	R	89	453	220	4
Avos Rock	7/10	B	HO	9	0	0	0
Onekotan	7/11	B	HO	11	10	0	0
Atlasova	7/11	B	HO	10	87	0	0
Total				656	2,959	1,445	34

[1]S = Spook or cliff count; B = Boat count.
[2]R = Rookery; HO = Haul-out.

Table 2. --Composition counts of Kuril Island northern sea lions observed at rookeries and associated bachelor bull haul-outs during summer 1989 Rubezhnoe cruise*.

Location	Date	Adult male			Adult female	Juv.	Unknown
		Terr.	Other	Sum			
Lovushki Dolgaya	6/19	107	44	151	422	Y	
Raykoke	6/21	37	39	76	155	7	
Srednego Khitraya	6/22	67	39	106	330	4	
Brat Chirpoyev							
Rookery	6/24	65	53	118	384	11	
Haul-out			50	50			
Total		65	103	168	384	11	
Ketoy							
Rookery	7/04	11		11	81	5	
Haul-out	7/04		101	101			
Total		11	101	112	81	5	
Shiashkotan Rookery	7/08	3	67	70	22	6	85
Antsiferova							
Rookery	7/10	34	37	71	216	13	
Haul-out			237	237			
Total		34	274	308	216	13	
Overall total		324	667	991	1,610	46	85

*These counts may not be exactly the same as those in the mean counts table.

Table 3.--Mean counts of Aleutian Island northern sea lions by site and sex-age category from summer 1989 Rubezhnoe cruise.

Location	Date	Survey type*	Adult male	Other adults & juveniles	Pups	
					Alive	Dead
Kiska	7/16-17					
Lief Cove		B/S	126	451	293	4
Cape St. Stephens		B/S	248	512	258	2
Other west side		B	187	16	2	0
Total			561	979	553	6
Seguam	7/18-19					
Saddleridge		B/S	161	739	529	6
Other N. side		B	97	55	8	0
South Side		B	75	26	13	0
Total			333	820	550	6
Bogoslof	7/22	B/S	185	595	358	23

*S = Spook or cliff count; B = Boat count.

Table 4. --Composition counts of Aleutian Island northern sea lions by site and sex-age category from summer 1989 Rubezhnoe cruise[1].

Location	Date	Adult male			Adult female	Juv.	Unk.
		Terr.	Other	Total			
Kiska	7/17	126	435	561	882	8+	89
Seguam	7/18-19	98	235	333	812	8	-
Bogoslof	7/22[2]	-	-	185	583	12+	-

[1]These counts may not be exactly the same as those in the mean counts table.
[2]Territorial males difficult to distinguish by this time.

Table 5. --Counts of other pinnipeds and sea otters seen in Kuril Island surveys during summer 1989 Rubezhnoe cruise.

Site	Date	Section*	E. lutris		P. vitulina		P. largha
			Adult	Pup	Adult	Pup	Adult
Raykoke	6/21	all	1				
Srednego Khitraya	6/23	all			1		
Brat Chirpoyev	6/24	1-2	4		41	4	
Ushishir	6/23	lake			1		
Iturup	6/28	1	8	2	26		1
Urup	6/29	1-3	92	40	59	9	10
	7/01	4-5	78	26	24		55
Simushir	7/02	1	89	11	18		
	7/03	2	21	5			
Ketoy	7/03	1	59	7	46		1
	7/04	2	17	7	2		
Shiashkotan	7/07	1-4	125	30	71	1	
Antsiferova	7/10	all	16	9	6		
Onekotan	7/11	part	6	2			5
Atlasova	7/11	1	27	10	49	2	6
Total	-	-	543	149	344	16	78

*Sections described in Appendix Table 1.

Islands in the Aleutian Islands (Table 6) found 442 sea otters (including 89 pups), 126 harbor seals (including at least 12 pups), and 723 northern fur seals (including 99 pups). Most of the Aleutian Island fur seals were seen at Bogoslof Island.

We observed nine different species of marine mammals during the pelagic surveys conducted while the ship was under way (Table 7, Appendix Table 6). These included 488 Dall's porpoise (Phocoenoides dalli), 44 killer whales (Orcinus orca), 14 humpback whales (Mesaptera novaeangliae), 10 minke whales (Balaenoptera acutorostrata), 4 sperm whales (Physeter macrocenhalus), 17 northern fur seals, 2 northern sea lions, 1 ribbon seal (Phoca fasciata), and 4 sea otters.

Entangled Marine Mammals

Six northern sea lions and 16 northern fur seals were observed either entangled in debris or with wounds indicating past entanglement. Sixteen of these animals were observed at four rookeries in the Kurils, one at Kiska, and five at Bogoslof (Table 8). One of the sea lions and two of the fur seals were females. Most animals simply had a wound from 180° to 360° around the neck, and with no debris visible. All animals appeared healthy.

Seabirds

We observed 26 different bird species during our boat survey of 13 of the Kuril Islands (Table 9). Eleven of these species were observed to be nesting. With the exception of slaty-backed gulls (Larus schistisagus), white tailed eagles (Haliaeetus

Table 6. --Counts of other pinnipeds and sea otters Aleutian Island surveys during summer 1989 Rubezhnoe cruise.

Site	Date	E. lutris		P. vitulina		C. ursinus			
						Adult			
		Adult	Pup	Adult	Pup	M.	F.	Juv.	Pup
Kiska	7/16								
Concord Pt. to Lief Cove		74	24	4	1				
Lief Cove to Cape St. Stephens		64	24						
Cape St. Stephens		>56	0			1		2	
Total		194	48	4	1	1		2	
Seguam									
North	7/18	93	26	55	8			1	
South	7/19	66	15	54	3				
Total		159	41	109	11			1	
Bogoslof		0	0	1	0	29	132	459	99*

*Includes 93 live and 6 dead pups.

Table 7.--Summary of pelagic sightings of other marine mammals during summer 1989 Rubezhnoe cruise.

Species	Number seen		Group size	
	Individuals	Groups	Range	Mean
Cetacea:				
Balaenoptera acutorostrata	10	5	1-4	2.0
Megaptera novaeangliae	14	2	4-10	7.0
Orcinus orca	44	15	1-8	2.1
Phocoenoides dalli	488	100	1-18	4.9
Physeter macrocephalus	4	2	1-3	2.0
Pinnipedia:				
Callorhinus ursinus	17	17	1	1.0
Eumetopias jubatus	2	2	1	1.0
Phoca fasciata	1	1	1	1.0
Carnivora:				
Enhydra lutris	4	2	1-3	2.0

Table 8. --Entangled marine mammals seen during summer 1989 Rubezhnoe cruise.

Site	Date	Species	Sex	Age	Description
Lovushki	6/19	C. ursinus	M	4-6	Grey web, deep 360° wound
		C. ursinus	M	4-6	-
	7/05	C. ursinus	M	4-6	2-3 strands white trawl; 360°
		C. ursinus	F	A	
		C. ursinus	U	U	Maminov observation
	7/08	C. ursinus	F	A	-
Raykoke	6/21	E. jubatus	M	A	territorial male; 180° wound
		E. jubatus	M	A	territorial male; 360° wound with white material
Srednego	6/22	E. jubatus	M	A	trawl web; 360° wound
		C. ursinus	M	U	-
		C. ursinus	M	4-6	blue packing band; no wound
		C. ursinus	M	4-6	-
		C. ursinus	U	U	Maminov observation
		C. ursinus	U	U	Maminov observation
		C. ursinus	U	U	Maminov observation
Brat Chirpoyev	6/24	E. jubatus	F	A	single strand of trawl web
Kiska	7/16	E. jubatus	M	A	360° wound; animal OK; no sign of debris
Bogoslof	7/22	E. jubatus	M	A	360° wound; animal OK; no sign of debris
		C. ursinus	M	A	1-2 strands green trawl web around neck
		C. ursinus	M	SA	Maminov observation
		C. ursinus	U	SA	Maminov observation
		C. ursinus	U	SA	Maminov observation

Table 9.--Bird sightings by island during summer 1989 Rubezhnoe cruise. N = nesting and X = seen.

Species	Island			
	Shumshu	Atlasova	Antsiferova	Avos
Pelagic cormorant (Phalacrocorax pelagicus)		X		
Red-faced cormorant (P. urile)		X	X	
Temminck's cormorant (P. filamentosus)				
Harlequin duck (Histrionicus histrionicus)		X	X	
Oldsquaw (Clangula hyermalis)				
Black scoter (Melanitta nigra)		X		
Common murre (Uria aalge)	X		X	
Thick-billed murre (U. lomvia)		X	N	N
Pigeon guillemot (Cepphus columba)		X	N	
Ancient murrelet (Synthliboramphus antiquus)			X	
Parakeet auklet (Aethia psittacula)				
Least auklet (A. pusilla)				
Whiskered auklet (A. pygmaea)				
Crested auklet (A. cristatella)				
Tufted puffin (Fratercula cirrhata)	X	N	N	N
Horned puffin (F. corniculata)				
Northern fulmar (Fulmaris glacialis)	X	X	N	
Fork-tailed storm petrel (Oceanodroma furcata)			X	
Leach's storm petrel (O. leucorhoa)	X			
Parasitic jaeger (Stercorarius parasiticus)	X			
Slaty-backed gull (Larus schistisagus)		N	N	X
Black-legged kittiwake (L. tridactyla)	X	X	N	
White tailed eagle (Haliaeetus albicilla)				
Peregrine falcon (Falco peregrinus)				
Snow bunting (Plectrophenax nivalis)		X		
Northern raven (Corvus corax)				

Table 9.--Bird sightings by island during summer 1989 Rubezhnoe cruise (continued).
N = nesting and X = seen.

Species	Island			
	Onekotan	Shiashkotan	Lovushki	Raykoke
Pelagic cormorant (Phalacrocorax pelagicus)				
Red-faced cormorant (P. urile)		N	N	
Temminck's cormorant (P. filamentosus)				
Harlequin duck (Histrionicus histrionicus)		X		X
Oldsquaw (Clangula hyermalis)				
Black scoter (Melanitta nigra)				
Common murre (Uria aalge)		N	?	
Thick-billed murre (U. lomvia)	N		?	N
Pigeon guillemot (Cepphus columba)		X	N	X
Ancient murrelet (Synthliboramphus antiquus)				
Parakeet auklet (Aethia psittacula)			X	N
Least auklet (A. pusilla)				
Whiskered auklet (A. pygmaea)	X	X		
Crested auklet (A. cristatella)				N
Tufted puffin (Fratercula cirrhata)	X	X	N	X
Horned puffin (F. corniculata)		X		
Northern fulmar (Fulmaris glacialis)		N		X
Fork-tailed storm petrel (Oceanodroma furcata)		X	X	
Leach's storm petrel (O. leucorhoa)			X	
Parasitic jaeger (Stercorarius parasiticus)				
Slaty-backed gull (Larus schistisagus)	N	N	N	N
Black-legged kittiwake (L. tridactyla)	X	X	N	N
White tailed eagle (Haliaeetus albicilla)				
Peregrine falcon (Falco peregrinus)				
Snow bunting (Plectrophenax nivalis)				
Northern raven (Corvus corax)				

Table 9.--Bird sightings by island during summer 1989 Rubezhnoe cruise (continued).
N = nesting and X = seen.

Species	Island				
	Ketoy	Simushir	B. Chirpoyev	Urup	Iturup
Pelagic cormorant (Phalacrocorax pelagicus)					
Red-faced cormorant (P. urile)	X	X	X		
Temminck's cormorant (P. filamentosus)					X
Harlequin duck (Histrionicus histrionicus)	X				X
Oldsquaw (Clangula hyermalis)		X			
Black scoter (Melanitta nigra)					
Common murre (Uria aalge)					?
Thick-billed murre (U. lomvia)			N		?
Pigeon guillemot (Cepphus columba)	N		X	X	
Ancient murrelet (Synthliboramphus antiquus)					
Parakeet auklet (Aethia psittacula)					
Least auklet (A. pusilla)					X
Whiskered auklet (A. pygmaea)					
Crested auklet (A. cristatella)			X		
Tufted puffin (Fratercula cirrhata)	X	N	X	N	X
Horned puffin (F. corniculata)		X			
Northern fulmar (Fulmaris glacialis)	X	X	N		X
Fork-tailed storm petrel (Oceanodroma furcata)				X	
Leach's storm petrel (O. leucorhoa)				X	
Parasitic jaeger (Stercorarius parasiticus)					
Slaty-backed gull (Larus schistisagus)	N	X	X		X
Black-legged kittiwake (L. tridactyla)	X	N			X
White tailed eagle (Haliaeetus albicilla)		X	X		
Peregrine falcon (Falco peregrinus)		N			
Snow bunting (Plectrophenax nivalis)	X	X			X
Northern raven (Corvus corax)			X		

albicilla), and Japanese or Temminck's cormorants (Phalacrocorax filamentosus) the composition of the Kuril Island bird fauna was similar to that of the Aleutian Islands (Murie and Scheffer 1959). The most abundant seabird species were northern fulmars (Fulmarus olacialis), slaty-backed gulls, and tufted puffins (Fratercula cirrhata). These were observed in large numbers at most islands. Shuntov (1988) also observed that northern fulmars and slaty-backed gulls were the most common seabirds in pelagic surveys offshore of the Kuril Islands. Raykoke Island supports the largest northern fulmar colony in Soviet waters (Maminov[2]). It also had the greatest number of parakeet auklets (Aethia psittacula) and crested auklets (A. cristatella) observed by us during the cruise. The second most common group of birds were those observed in the kelp beds or immediately near shore and included red-faced cormorants (Phalacrocorax urile), pigeon guillemots (Cepphus columba snowi), and harlequin ducks (Histrionicus histrionicus).

Land birds were occasionally observed during close approaches to shore and during landings. Usually these were passerines and were difficult to identify, although snow buntings (Plectrophenax nivalis) were seen on beaches. Raptors were seen on a few islands; white-tailed eagles and a nesting peregrine falcon (Falco peregrinus) were the only species identified.

[2]M. K. Maminov, Pacific Scientific Research Institute of Marine Fisheries and Oceanography, Vladivostok, U.S.S.R. Pers. commun. July 1989.

Branding and Tagging

Marking of sea lion pups was performed at four sea lion rookeries in the Kuril Islands--Lovushki (Dolgaya Rock), Raykoke, Srednego (Khitraya Rock), and Brat Chirpoyev. Tagging dates and the number of pups marked were as follows:

1. Dolgaya Rock--19-20 June--200 pups
2. Raykoke--21 June--l39 pups
3. Khitraya Rock--22-23 June--200 pups
4. Brat Chirpoyev--24 June--200 pups

Working conditions were arduous. Landings on two of the islands (Dolgaya and Khitraya) were difficult, and the rookeries were exhausting to work in because of their uneven relief and slippery substrate (the rookeries were covered with fecal and placental material). U.S. scientists branded at the first three sites, and Soviets at Brat Chirpoyev.

Each pup was sexed, and the overall sex ratio was 0.95 males per female. More males than females were found at Dolgaya Rock (1.06:1) and Khitraya Rock (1.11:1), while fewer males than females were found at Raykoke (0.85:1) and Brat Chirpoyev (0.95:1).

The first fifty-two pups (25 females and 27 males) tagged at Dolgaya Rock on 19 June were also weighed. Their average weight was 26.6 kg (s = 4.09). Average weight for the 25 female pups (24.7 kg) was significantly different ($p<0.001$) from the weight of the first 25 male pups (28.9 kg).

On 5 July we returned to Dolgaya Rock and reweighed 26 of

the original 52 pups. Average weight gain for the 16-day period was 5.5 kg (+19.4%) or around a third of a kilogram per day. Fifteen males gained an average of 6.3 kg (+20.9%), while 11 females gained an average of 4.4 kg (+16.9%). Males still weighed significantly more ($p<0.005$) than the females and also put on more weight per day (both absolutely and relatively).

On our return to Dolgaya Rock we observed that many brands were difficult to read, but others looked very crisp. The latter all retained a bright red appearance. The Allflex tags still were very readable, and there was no evidence of infection in the flipper around the tag's post. We found eight dead pups (three tagged and five not tagged).

Radiotelemetry

Instruments were deployed at Dolgaya Rock on 19-20 June. Operations went well with one exception--two immobilized females were mounted by adult territorial males. The first female was drowned by the male, and in the second instance we chased the male off the female. In total we darted seven animals. Four were instrumented--three with radio (VHF) tags only, and one with a VHF tag, satellite tag (PTT), and time-depth recorder (TDR). Two animals were too lightly anesthetized to work with, and the seventh animal was the one killed by the male. No deaths due directly to the drug occurred. An unmanned data collection computer (DCC) telemetry station was placed on a small hill overlooking the Dolgaya Rock rookery.

We began radio-tagging sea lions at Brat Chirpoyev on 24 June (Table 10). The first female darted was also mounted by a male. In the process of chasing the male off the female, a second darted female was also chased into the water. The first female was then outfitted with the complete VHF, PTT, and TDR instrument package. Drugging then ceased for the day. The next morning we returned to the rookery to tag additional animals.. However, the female tagged the previous day was found dead on the beach. Because the female was turned over on her back, wedged into a crevice, and her chest was bitten up it appeared to us that she had been crushed by another animal. At this point, further operations at the site were terminated.

We returned to Dolgaya Rock on 5 July to recover instruments. On that day, we collected the DCC station but not the PTT and TDR. Analysis of the DCC record indicated that at least two of the four radio-tagged animals had been on shore at the time of our arrival; however, they then went into the water. This included the animal with the PTT and TDR. We waited on 6 July for her but she did not return. We worked elsewhere on 7 July and returned the morning of 8 July. She was on the beach at that time, and we went ashore and collected her. Unfortunately, both the PTT and TDR were gone, although the neoprene base of the attachment remained. Tie wraps (four per instrument) were also gone, thus giving the appearance that either the tie wraps failed or the instruments had been ripped from the neoprene and epoxy.

Three of the four radio-tagged animals provided information

Table 10.--Results of anesthetizing northern sea lions during summer 1989 Rubezhnoe cruise.

Female	Location	Date	Dose	Result
1	Lovushki	6/19	500mg	Down fine but mounted and apparently drowned by territorial male.
2	Lovushki	6/19	500mg	Down fine but light. VHF tag only (#720).
3	Lovushki	6/19	500mg on rump	Down but too light. VHF tag (#780)
4	Lovushki	6/19	500mg	Never down enough to work; male mounted her and in running him off she went too. Not all drug injected.
5	Lovushki	6/20	500mg	Down fine but light. Full set of instruments (#859).
6	Lovushki	6/20	500mg	Down but too light. Put VHF tag on rump (#970).
7	Lovushki	6/20	500mg	Shot in heel. Never down.
8	Brat Chirpoyev	6/24	500mg	Down light and perfectly workable. Full set of instruments. Up but groggy when left. Found dead next day. She was on her back with bites on her chest--looked like a male may have mounted her.
9	Brat Chirpoyev	6/24	500mg	Never down; had to chase male away and she went too.
10	Kiska	7/17	500mg	Never down far enough down to work.

usable for analysis of trip patterns (Table 11). All three animals appear to have been tagged during their perinatal periods (the time period after birth of a pup and before the first trip). Animals 720 and 859 had perinatal periods lasting at least 7 days, while animal 970's period was at least 11 days. Animal 720 then began a consistent pattern averaging 15.5 hours ashore followed by an 8.6 hour trip (about a third of the time at sea). Animal 859 made two trips after the end of the perinatal period, with these lasting about 33.9 hours; her one visit to land was 60.8 hours (again about a third of the time at sea). Animal 970 made only one trip (52 hours) during the period and was on land when we returned to collect instruments.

When we returned to the Aleutians we continued the radio tagging of adult female sea lions (now outside of the breeding season). One female was anesthetized at Cape St. Stephen at Kiska (Table 10). However, the drug's effect was insufficient to allow the animal to be tagged. No suitable sites for radio tagging were found at Seguam Island.

Collections

Pinnipeds and Sea Otters

Between 28 June and 10 July, we collected eight sea lions (three males and five females), one **male** fur seal, one female harbor seal, one female spotted **seal,** and seven sea otters (five males and two females, Table 12). All but the fur seal (which was found freshly dead in the water) were collected by shooting

Table 11.--Time (hours) on land and at sea of adult female northern sea lions radio tagged at Dolgaya Rock during summer 1989 Rubezhnoe cruise.

Trip cycle	Location	Female number 720	780	859	970
1	On land	175.25[1]	0.25	5.25	3.25
	At sea	10.75	-	21.75	1.25
2	On land	14.25		176.75[1]	265.50[1]
	At sea	8.75		33.75	52.00
3	On land	16.25		60.75	
	At sea	8.75		34.00	
4	On land	15.25			
	At sea	8.50			
5	On land	14.50			
	At sea	8.25			
6	On land	15.50			
	At sea	9.75			
7	On land	17.00			
	At sea	5.75			
	On land[2] $\bar{x}$	15.45	-	60.75	-
	sd	1.04	-	-	-
	n	6	0	1	0
	At sea[2] $\bar{x}$	8.64	-	33.89	52.00
	sd	1.54	-	-	-
	n	7	0	2	1

[1]Perinatal period.
[2]Includes only times on land and at sea after perinatal period.

Table 12. --Takes of marine mammals by site, species, and sex during summer 1989 Rubezhnoe cruise.

Site	Date	Species	Sex	Take
Urup	6/29	E. lutris	F	1
		E. lutris	M	1
		P. vitulina	F	1
		P. largha	F	1
Simushir	7/02	E. lutris	M	1
Simushir	7/03	E. lutris	F	1
Ketoy	7/04	E. jubatus	M	2
Lovushki	7/05	E. jubatus	F	2
		C. ursinus	M	1 (found dead)
Lovushki	7/06	E. jubatus	F	2
			M	1
Shiashkotan	7/08	E. lutris	M	2
Lovushki	7/08	E. jubatus	F	1
Antsiferova	7/10	E. lutris	M	1
Total		E. lutris	M	5
			F	2
		E. jubatus	M	3
			F	5
		P. largha	F	1
		P. vitulina	F	1
		C ursinus	M	1 (found dead)

either with a shotgun (seals and otters) or a rifle (sea lions). The collection of sea lions was limited to 20 by the Soviet's collection permit, All wounded animals plus the two animals that had died after radio tagging were counted against this limit. While we still had six animals remaining on the permit at the end of the period it was decided to discontinue collections because of the difficulty in finding females at the remaining survey sites.

Skulls, stomachs, and tissues were collected from all of these animals and are curated at NMML. Tissues were collected by the previously discussed sampling protocol. Seven sea lions, five otters, one harbor seal, one spotted seal, and one fur seal had a full regimen of tissues sampled. The remaining sea lion, two otters, one harbor seal, and one spotted seal had the abbreviated set of tissues sampled. Ovaries of two additional sea lions found dead (one at Dolgaya and one at Brat Chirpoyev) were collected and preserved in 10% formalin. Skulls were also collected from eight sea lions and one fur seal found dead on the shore. Tissues of all animals other than the sea otters have been returned to NMFS laboratories for disease and pollutant analysis. Otter tissues will be processed by U.S. Fish and‘ Wildlife Service.

Stomachs and colons of all pinnipeds were examined for contents (Table 13). Four of the sea lion stomachs contained remains of Oncorhynchus gorbuscha, and four contained cephalopod beaks or tissue. Two of the collected sea lions (and the two

Table 13. --Stomach contents of pinnipeds taken during summer 1989 Rubezhnoe cruise.

Item	U.S. Specimen # PL1	PV1	CU1	EJ4	EJ5	EJ6	EJ7	EJ11	EJ12	EJ13	EJ14
Sex	F	F	M	M	M	F	F	F	F	M	F
Take Location*	U	U	L	K	K	L	L	L	L	L	L
Empty		X					X				X
Fish											
Oncorhynchus gorbuscha								X	X		
Unknown sp.				X						X	
Salmonid eggs				X				X			
Cephalopod											
Squid	X		X							X	
Octopus				X	X	X					
Chiton										X	
Rock				X	X				X	X	

*U=Urup, K=Ketoy, L=Lovushki.

dead sea lions examined on the beach) had empty stomachs. The harbor seal had an empty stomach while the stomachs of the spotted seal and fur seal contained squid beaks.

Scats were collected in the Aleutian Islands--10 at Kiska (Cape St. Stephen), 11 at Seguam (Saddleridge), and 10 at Bogoslof Islands. Analysis of this small sample indicates that food habits vary. Six of the 10 scats collected at Kiska contained fish eggs, identified by Makhnyr as those of greenling (Hexasrammos spp.). One of the two otoliths found there appears to be from the same genus. Scats obtained at Seguam contained no eggs, and otoliths found in either scats or spewings appear to be those of Pacific cod (Gadus macrocephalus). These findings contrast with the stomach contents found in the Kuril Island animals, which indicated a preference for salmonids and cephalopods. Notably absent were remains of walleye pollock (Theragra chalcogramma).

Seabirds

Twelve seabird carcasses were salvaged. These included two slaty-back gulls, one northern fulmar, three Leach's storm petrels (Oceanodroma leucorhoa), one fork-tailed petrel (Oceanodroma furcata), one red-faced cormorant, two tufted puffins, and one crested auklet. These specimens were given to the U.S. Fish and Wildlife Service.

Fish

Otoliths were collected from 13 marine fish species. These included rock greenling (Hexagrammos lagocephalus), three

different sculpins (Hemilepidotus gilberti, Myoxocephalus jaok, Myoxocephalus sp.), rockfish (Sebastes steindachneri), pricklebacks (Stichaeus grigorjewi), Liopsetta obscura, Dolly Varden trout (Salvelinus malma), Salvelinus leucominus, Pacific sandfish (Trichodon trichodon), rock sole (Lepidopsetta bilineata), starry flounder (Platichthys stellatus), and Pacific cod. The sculpins, rockfish, pricklebacks, L. obscura, and S. leucominus are all species not known to occur in U.S. waters. All of these fish except for two of the rock greenling and four of the rock sole were collected in the Kuril Islands. The remainder were collected at Kiska Island.

DISCUSSION

Implications of the Survey Results

Numbers of adult and juvenile sea lions on Kuril Island rookeries declined 61%, from 6,916 animals in 1969 to 2,719 in 1989 (Kuzin et al. 1984; Fig. 3; Table 14). Numbers on all sites (i.e., rookeries and haul-outs) declined 74%, from 14,076 in 1969 to 3,615 in 1989. Most of this decline appears to have occurred between 1969 and 1974, similar to the initial declines observed in the eastern Aleutian Islands (Braham et al. 1980). Kuril Island adult numbers appear to have remained relatively constant since 1974. Pup numbers have declined 60%, from 3,673 animals in 1963 to 1,476 animals at the present (Perlov 1970; Fig. 4, Table 15). Between 1983 and 1989, pup numbers declined 26% (from 1,992 to 1,476; Maminov unpubl. data). Large declines in pup numbers

Table 14.--Comparison of number of adult and juvenile northern sea lions counted during June-August 1963 through 1989 at the five primary rookeries in the Kuril Islands.

Date	Antsiferova	Dolgaya Rock	Raykoke	Khitraya Rock	Brat Chirpoyev	Kuril Is. Total
7-8/63[1]	750	1,518	1,000	3,000	1,500	7,768
7-8/67[1]	1,200	1,612	767	3,058	nc	6,637+
7-8/68[1]	917	1,110	488	3,250	2,183	7,948
6-7/69[2]	892	1,062	654	3,073	1,235	6,916
6-8/74[2]	nc	1,173	572	562	934	3,241+
6-8/76[2]	nc	695	450	495	993	2,633+
7-8/81[2]	457	564	411	1,017	409	2,858
6-7/89[3]	542	760	266	566	585	2,719

[1] Perlov 1970.
[2] Kuzin et al. 1984.
[3] This survey.

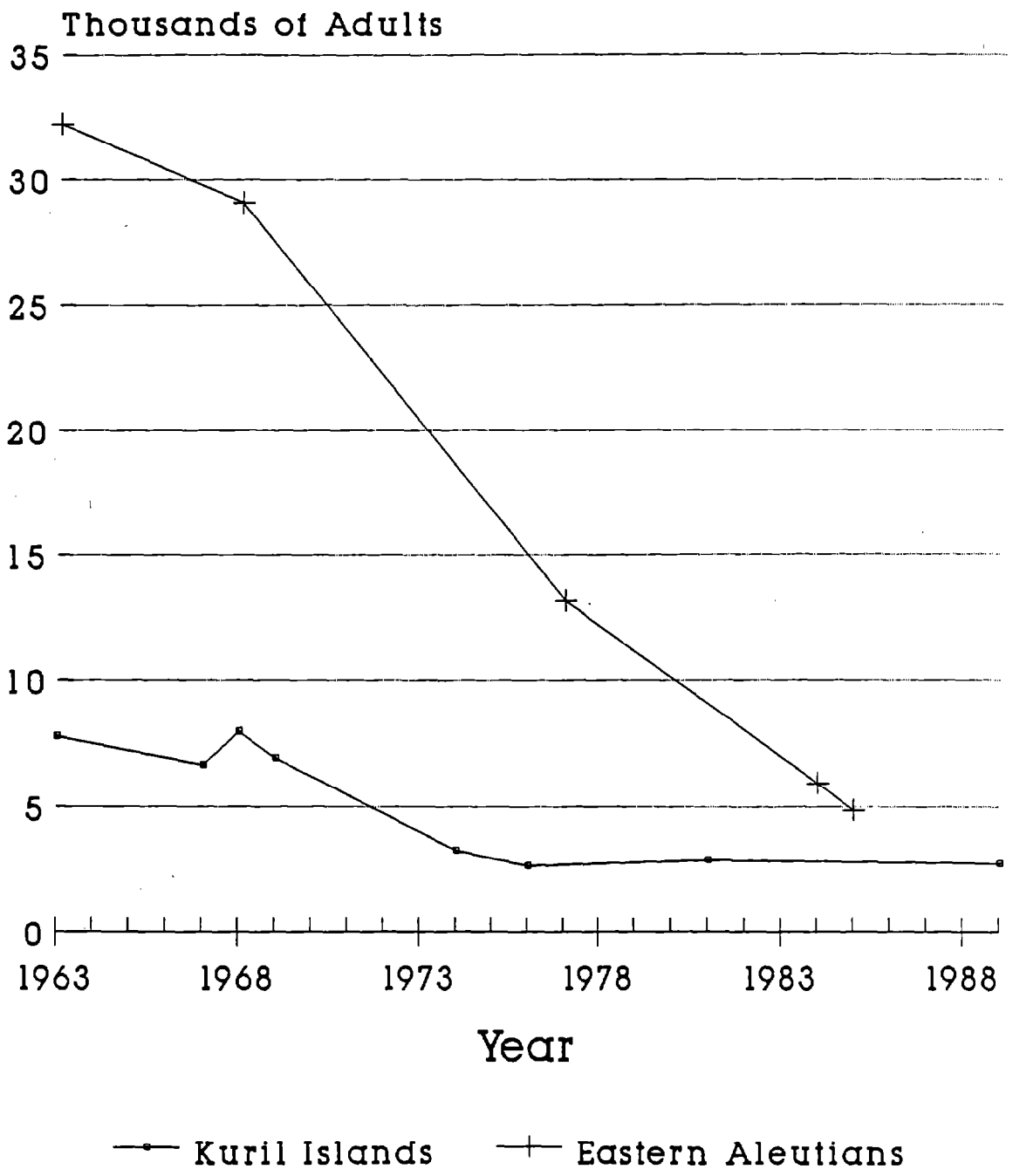

Figure 3. --Trends from 1963 to 1989 in adult and juvenile northern sea lion numbers in the Kuril and Aleutian islands.

Table 15, --Comparison of number of pups (alive and dead) counted during June-August 1963 through 1989 at the five primary rookeries in the Kuril Islands.

Date	Antsiferova	Dolgaya Rock	Raykoke	Khitraya Rock	Brat Chirpoyev	Kuril Is. Total
7-8/63[1]	65	1,003	350	1,500	755	3,673
7-8/67[1]	30	750	103	1,054	nc	1,937+
7-8/68[1]	114	524	214	nc	70	922+
6-7/69[2]	15	623	477	1,500	605	3,220
6-8/74[2]	nc	538	238	386	585	1,747+
6-8/76[2]	nc	574	240	735	530	2,079+
7-8/81[2]	8	340	136	730	426	1,640
6-7/83[3]	189	492	168	746	397	1,992
6-7/89[4]	224	381	162	433	276	1,476

[1] Perlov 1970.
[2] Kuzin et al. 1984.
[3] Maminov unpubl. data.
[4] This survey.

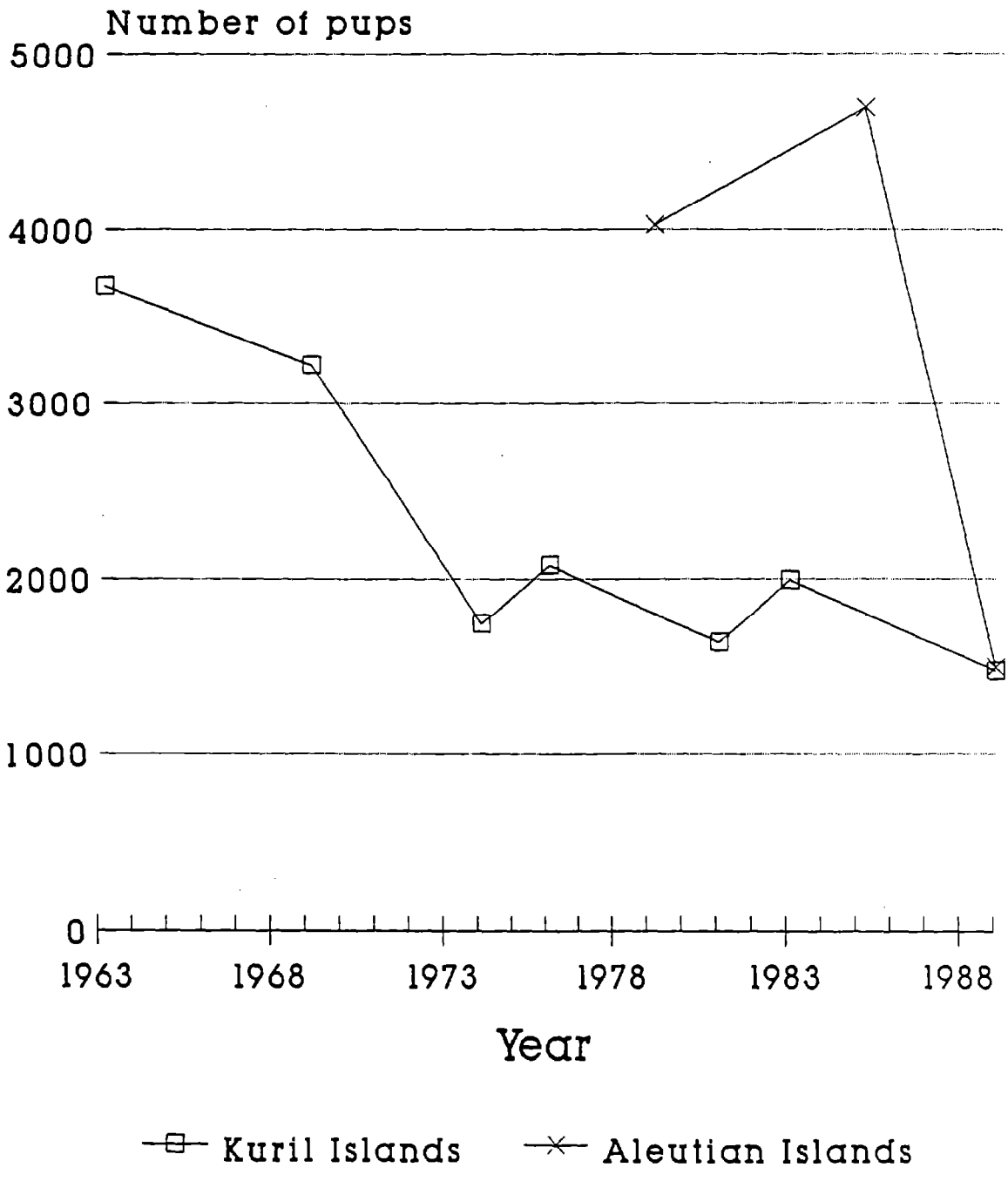

Figure 4--Trends from 1963 to 1989 in northern sea lion pup numbers in the Kuril and Aleutian islands.

occurred at Dolgaya Rock (-23%), Khitraya Rock (-42%), and Brat Chirpoyev (-31%). Antsiferova wasthe only rookery to show an increase (+19%), while Raykoke showed little change (-4%). It is unknown whether this decline in pup numbers is a sampling artifact or is a harbinger of adult declines to come (Berkson and DeMaster 1985).

Recent trends in Aleutian Island adult and juvenile sea lion populations are discussed in Loughlin et al. (1990). With regards to pup numbers, we do not have complete counts of pups for any previous Kiska Island survey, so an accurate estimate of the change in pupping cannot be made there. However, complete pup counts exist for both 1979 and 1985 at Seguam and Bogoslof Islands (Table 16). Since 1985, there have been declines of 79% and 66%, respectively, in the number of pups born at the two sites. Adult numbers, though not as reliable an indicator of population trends, also declined at the three sites.

The few juvenile sea lions seen provide support to the hypothesis that decreasing juvenile survival is one of the causes of the current decline in sea lion numbers (Merrick et al 1987).

Low rates of entanglement for sea lions in both the Kuril (0.11% overall, 0.03% adult females) and Aleutian Islands (0.06% overall) provide additional support to the argument that entanglement is not causing the declines in sea lion numbers (Loughlin et al. 1986).

We kept a watch for fishing vessels throughout our work, and on two occasions we did observe trawlers offshore of the Kuril

Table 16. --Comparison of number of pups (alive and dead) counted in 1979, 1985, and 1989 at three islands in the Aleutian Islands.

Location	1979[1] Date	1979[1] No.	1985[2] Date	1985[2] No.	1989 Date	1989 No.	Percent Difference 1979-89	Percent Difference 1985-89
Kiska	7/08	613[3]	7/6	884[3]	7/16-17	559	> -9%	> -37%
Seguam	7/12-13	2,500	6/30	2,688	7/18-19	556	-78%	-79%
Bogoslof	7/15	914	7/14	1,120	7/22	381	-58%	-66%

[1] Fiscus et al. 1981.
[2] Merrick et al. 1987.
[3] Partial counts.

Islands trawling for walleye pollock (four trawlers on east side of Simushir on 2 July, and four trawlers on the north side of Shumshu Island on 12 July). We discussed with the fish master aboard the Rubezhnoe whether animals were frequently caught incidentally in trawling. His opinion was that this was rather rare. Maminov's opinion was that either competition for prey or drowning in nets was the major reason for the declines.

Data in Shuntov et al. (1988) indicates that walleye pollock catches increased dramatically during the period that the Kuril Island sea lion decline began. It was at the start of this period that Perlov (1975) found walleye pollock in 61.8-69.5% of the stomachs (with contents) of northern sea lions collected in the central and northern Kuril Islands. We found little evidence of any consumption of walleye pollock at any site in either the Kuril or Aleutian Islands. This was despite the findings of Perlov (1975) and Lowry et al. (1989) that walleye pollock was a major prey item of northern sea lions. Perhaps these results reflect a seasonal preference for other prey or a decreasing role of walleye pollock in the sea lion diet. If the latter is the case, then this may indicate that prey availability has changed in recent years.

Branding and Tagging

Soviet scientists tagged Kuril Island sea lion pups on at least two previous occasions (Perlov 1972). They applied monel rather than the plastic flipper tags used in this project. They

had not branded sea lions before this project. Thus, this project introduced several new techniques. In general, the operation went well. Kuril Island sites were, however, more difficult to work at than most Aleutian Island and Gulf of Alaska sites, and required significantly more effort to tag the same number of animals. We suspect that the dirtiness of the pups' fur (which sometimes required the brand to be held on for 30 seconds, rather than the usual 5 seconds, before all the fur was burned off) will contribute to a high number of unreadable brands. In addition, detritus on the rookery made tag numbers difficult to read, although the colors were clearly distinguishable.

A full set of branding and tagging equipment has been left with the Soviets, and they can continue branding in the same manner as the U.S. scientists.

Radiotelemetry

The short trip lengths and the balance of on-land versus at-sea time of animal 720 is similar to that observed at Marmot and Ugamak Islands (Merrick et al. 1988). The length of perinatal periods for the three animals appear similar for the different areas (Merrick 1987, Merrick et al. 1988).

Although we gained little additional information on sea lion foraging, a considerable amount was learned about anaesthetics and deployment of instruments. First, it appeared that territorial males at the Kuril Island rookeries were more

aggressive than those observed at U.S. rookeries. Any future radio tagging will require that anesthetized animals be guarded until they are completely recovered, or must take place outside of the mating season (post 15 July).

Second, drug doses were too small in most cases. Lacking good estimates of animal weights, we gave a standard dosage of 500 mg of Telazol (Loughlin and Spraker 1989). In at least three cases this was an insufficient dose. In the future, we intend to give animals a supplemental dose of 100-200 mg if they are not immobilized by the first dose.

Analysis of the PTT and DCC records indicated that the loss of instruments at Dolgaya Rock occurred after the female went to sea for the first time. Three location fixes were calculated from PTT transmissions prior to the female's first trip. No further signals were received from the PTT after the animal entered the water. The animal returned to land approximately 22 hours later, and additional signals were not received. Thus it appears that either the PTT was lost while the animal was in the water or the unit was rendered inoperable (due to antenna loss or water leakage). Because the unit was missing from the animal when we returned, the simplest explanation would be that she lost the unit on her first trip. This could have occurred either by the animal scraping rocks or by interactions with other animals. Ultimately, however, it is clear that both the PTT and TDR (but not VHF radio) were lost. This suggests that a stronger attachment technique is necessary.

Finally, the best sites for radio tagging (because of cover for stalking) appear to be Lovushki (Dolgaya Rock), Srednego (Khitraya Rock), Antsiferova, Kiska (Cape St. Stephens), and Ugamak Islands.

Collections

Disease and contaminant samples have not yet been processed and will be subject of a later report. Based on dissections of collected animals there was no evidence of a gross pathological condition that could be contributing to the decline in abundance.

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Species Act of 1973 (Sect. 17), and CITES permit US694250. Salvage and importation of seabird specimens was allowed under U.S. Fish and Wildlife permits PRT 4737952 and PRT 737953. Research within the Aleutian Island Unit of the Alaska Maritime National Wildlife Refuge was allowed under U.S. Fish and Wildlife Service Special Use permit 49023.

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APPENDICES

Appendix Table 1.--Section descriptions for Kuril Island seal and otter surveys during summer 1989 Rubezhnoe cruise.

Site	Section number	Section description
Brat Chirpoyev	1	Uglovaya Bay to Mys Semenova
	2	Mys Semenova to rookery
Iturup	1	Zaliv Dozornyy to Mys Gnevnyy
Urup	1	Skala Crab to Mys Tetyaeva
	2	Mys Tetyaeva to Skala Tramek
	3	Skala Tramek to Skala Odenokaya
	4	Raid Otakrete to Mys Klyuchevoy
	5	Mys Klyuchevoy to Ostrov Petrushova
Simushir	1	Mys Aront to Mys Rollin
	2	Bukhta Dutsnaya
Ketoy	1	Skala Ostrokonechnaya to Skala Odenokaya
	2	Skala Ostrokonechnaya to Mys Storojevo
Shiashkotan	1	Mys Uzhanen to Mys Nukonova
	2	Mys Nukonova to Mys Grotove
	3	Mys Grotove to Skala Bashmak
	4	Skala Bashmak to Mys Krasnee
Atlasova	1	Skala Svechka to Mys Ketrev

Appendix Table 2.--Evening positions and weather, summer 1989 Rubezhnoe cruise.

Date	Time	Location		Activity	Temperature		Baro. pres.
		Latitude	Longitude		Air	Water	
6/09	1700	53°53'N	166°31'W	Depart	6.1	0	1009
6/10	1500	55°31'N	167°20'W	Transit	6.4	0.5	1015
6/11	2330	56°04'N	171°07'W	Transit	5.0	5.4	1015
6/12	2111	55°45'N	177°15'W	Transit	6.0	5.9	1012
6/13	Crossed dateline						
6/14	2205	54°55'N	175°45'E	Transit	5.0	5.0	1016
6/15	2204	53°47'N	169°15'E	Transit	5.4	6.0	1016
6/16	2150	52°18'N	163°19'E	Transit	4.0	6.1	1018
6/17	2306	50°29'N	157°11'E	Transit	5.0	4.8	1016
6/18	1845	48°52'N	154°12'E	Stopped at Shiashkotan	5.0	2.0	1015
6/19	2400	48°33'N	153°51'E	Stopped at Lovushki	4.5	1.6	1021
6/20	2216	48°28'N	153°37'E	Transit to Raykoke	4.2	2.3	1024
6/21	2230	47°53'N	153°03'E	Transit to Srednego	4.0	2.5	1019
6/22	2300	47°30'N	152°52'E	Stopped at Srednego	6.3	2.1	1019
6/23	2100	47°30'N	152°49'E	Stopped at Srednego	7.0	2.5	1017
6/24	2300	46°28'N	150°47'E	Stopped at B. Chirpoyev	6.0	5.0	1021
6/25	2330	46°23'N	150°32'E	Transit to Urup	4.3	3.0	1021

Appendix Table 2.--Evening positions and weather, summer 1989 Rubezhnoe cruise (continued).

Date	Time	Location		Activity	Temperature		Baro. pres.
		Latitude	Longitude		Air	Water	
6/26	2200	45°16'N	148°05'E	Stopped at Iturup	8.5	2.1	1018
6/27	2325	45°23'N	147°48'E	Transit at Iturup	8.0	4.0	1019
6/28	2130	44°57'N	147°09'E	Transit to Urup	14.0	5.2	1014
6/29	2100	45°53'N	149°47'E	Stopped at Urup	12.0	2.6	1020
6/30	2100	45°56'N	149°51'E	Stopped at Urup	9.9	2.8	1019
7/01	2200	46°23'N	150°28E	Transit to Simushir	6.0	2.6	1020
7/02	2100	47°17'N	152°29'E	Stopped at Ketoy	14.0	2.2	1017
7/03	2100	47°03'N	152°11'E	Stopped at Simushir	10.0	2.2	1018
7/04	2130	47°35'N	152°44'E	Transit to Lovushki	11.0	1.9	1016
7/05	2300	48°34'N	153°52'E	Stopped at Lovushki	6.4	2.8	1011
7/06	2100	48°34'N	153°52'E	Stopped at Lovushki	7.0	2.0	1013
7/07	2130	48°46'N	154° 5'E	Stopped at Shiashkotan	8.0	2.0	1014
7/08	2200	48°52'N	154°13'E	Stopped at Shiashkotan	6.7	2.6	1010
7/09	2400	48°52'N	154°13'E	Stopped at Shiashkotan	8.5	2.9	1015

Appendix Table 2.--Evening positions and weather, summer 1989 Rubezhnoe cruise (continued).

Date	Time	Location		Activity	Temperature		Baro. pres.
		Latitude	Longitude		Air	Water	
7/10	2200	49°41'N	154°33'E	Transit to Onekotan	9.5	8.0	1018
7/11	2100	50°52'N	155°49'E	Transit to Shumshu	10.0	4.0	1013
7/12	2200	51°02'N	158° 8'E	Refueling at Kamchatka	14.1	1.1	1012
7/13	2030	52°21'N	160°20'E	Transit to Kiska	15.0	9.6	1012
7/14	2100	52°03'N	166°24'E	Transit to Kiska	12.1	9.0	1013
7/15	2100	51°49'N	172°44'E	Transit to Kiska	11.9	8.6	1019
7/16	2200	51°58'N	177°20'E	Lief Cove	10.0	7.8	1014
7/17	2200	52°13'N	178° 7'E	Transit to Seguam	8.0	5.6	1023
7/18	2200	52°37'N	175°58'W	Transit to Seguam	9.0	6.8	1027
7/18	2200	52°16'N	172°22'W	Transit to Lava Bay	9.0	4.8	1031
7/19	2200	52°23'N	172°24'W	Seguam	10.0	5.0	1026
7/20	2200	52°23'N	172°24'W	Seguam	12.0	4.3	1023
7/21	2200	53°09'N	170°37'W	Transit to Bogoslof	10.0	6.8	1017
7/22	2100	53°57'N	168° 2'W	Bogoslof	12.0	9.4	1022
7/23	2100	53°57'N	168° 2'W	Bogoslof	10.5	7.8	1019
7/24	2230	53°53'N	166°31'W	Dutch Harbor	12.5	6.3	1018

Appendix Table 3.--Raw counts of Kuril Island northern sea lions by site and sex-age category from summer 1989 Rubezhnoe cruise.

Location	Date	Time	Type*	Adult Male	Adult Female	Juv	Unk	Pups Alive	Pups Dead
Lovushki									
Dolgaya	6/19-20	1200	SS	144	422	0	0	364	9
			AS	151	422	Y	0	-	-
Vysokaya		1900	SB	22			45	8	?
Nizkaya		1900	SB	5			2		
Kotikovaya		1900	SB	15			59		
Raykoke	6/21	1100	SS	78	215	0	0	157	5
			AS	76	155	7	0	-	-
Srednego									
Khitraya	6/22	1100	SS	115	580	0	0	466	8
			AS	106	330	4	0	386	6
Brat									
Chirpoyev	6/24	1300							
Haul-out			SB	40			61		
			AB	77					
Rookery			SS/B	77	435			269	9
			AS/B	91	384	11		264	-
Iturup	6/28		SB	7			115		
Simushir	7/2	1100	SB	10			112	1	?
			AB	18		Y	79	1	?
Ketoy									
South HO	7/3	1000	SB	2			23	0	?
			AB	2		2	5	0	?
Rookery	7/4	1000	SB	12		-	184	2	0
			AB	11	81	5	-	2	0
Bach. HO	7/4	1000	SB	-					
			AB	101					

Appendix Table 3.--Raw counts of Kuril Island northern sea lions by site and sex-age category from summer 1989 Rubezhnoe cruise (continued).

Location	Date	Time	Type*	Adult Male	Adult Female	Juv	Unk	Pups Alive	Pups Dead
Shiashkotan									
Rookery	7/7-8	1540	SC/B	21		14	176	0	0
			AC/B	70	22	6	85	0	0
North HO	7/7	1700	SB				133	0	0
			AB	115				0	0
Antsiferova									
Haul-out1	7/10	1230	SB				247		
			AB	202			-		
Haul-out2			SB	33					
			AB	35					
Rookery			SC/S	68			228	229	5
			AC/S	71	216	13	-	210	3
Avos Rock	7/10	2000	SB	9					
			AB	9					
Onekotan	7/11	0900	SB	11			10		
			AB	11		9	1		
Atlasova	7/11	1800	SB	8			105		
			AB	12			69		

*SB = Soviet boat count; SS = Soviet spook count; SC = Soviet cliff count; AB = U.S. boat count; AS = U.S. spook count; AC = U.S. cliff count

Appendix Table 4.--Raw counts of Aleutian Island northern sea lions by site and sex-age category from summer 1989 Rubezhnoe cruise.

Location	Date	Time	Type*	Adult Male	Adult Female	Juv	Unk	Pups Alive	Pups Dead
Kiska									
Concord Point									
- Lief Cove	7/17	1630	SB	128	-	-		2	-
			AB	124	2	2	1	2	-
Lief Cove	7/16								
Rookery	7/16	1800	SB/S	-	462	-		293	3
			AB/S	126	440	Y		300	5
Lief Cove Rookery to Cape St. Stephens	7/17	0900	SB	58					
			AB	63					
Cape St. Stephens									
Area 1	7/17	1330	AS	41	30	0		37	1
Area 2	7/17	1030	SS	11	63			28	0
			AS	12	47	4		32	0
Area 3	7/17	1330	SS	132	131			119	0
			AS	-	110	2		105	1
Area 4	7/17	1400	SS	63	213		89	77	
Seguam									
Saddleridge									
Rookery	7/18	1330	SB/S	163	756			531	6
			AB/S	159	718	3		520,535	6
SW - S'ridge		1230	AB	86	52			7	
S'ridge - Wharf		1630	AB	27	6	4		2	
Wharf - M'hill		1900	AB	1					
North Side			AB	114	58	4		9	
			SB	79	48			7	
SW - Turf	7/19	1000	AB	76	14	1		10	
Turf - Lava		1400	AB		9			2	
Lava - M'hill		1800	AB	1					
South Side			AB	77	23	1		12	
			SB	73	28			13	
Bogoslof	7/22	1100	SB/S	156	607			389	25
			AB/S	214	570	12+		356,328	20

*SB = Soviet boat count; SS = Soviet spook count; SC = Soviet cliff count; AB = U.S. boat count; AS = U.S. spook count.

Appendix Table 5. --Detail of pup counts at Aleutian Island rookeries during summer 1989 Rubezhnoe cruise.

Location	Date	Time	Baker No.1	Baker No.2	Maminov No.1	Maminov No.2	Merrick No.1	Merrick No.2	Mean	SD
Kiska										
Lief Cove	7/16									
Beach 1		1800							0	
Beach 2A		1900	-	-	98	94	100	104	99	4.16
Beach 2B		1900	90	96	111	86	102	110	99	10.33
Beach 3		2030	108	94	91	87	99	93	95	7.33
Cape St. Stephens										
Area 1		1330					35	38	37	-
Area 2		1030	32	-	28	-	29	-	30	2.08
Area 3		1330	105	-	117	120	-	-	114	7.93
Area 4		1530	-	-	75	79	-	-	77	-
Seguam										
S'ridge	7/18	1330	535	-	532	-	520	-	529	7.93
Bogoslof	7/22	1100	328	-	389	-	356	-	358	30.53

Appendix Table 6.--Pelagic sightings of other marine mammals during summer 1989 Rubezhnoe cruise.

Date		Time	Location		Spec.*	No.	Sea State	Wind m/s	Water temp.
			Lat.	Long.					
6	9	1612	54°02'N	166°35'W	Pd	2	6	8	5
		1900	54°15'N	166°36'W	Pd	6	6	8	5
		2015	54°21'N	166°38'W	Pd	2	6	10	5
6	10	0400	54°45'N	166°45'W	Pd	3	6	8	5
		0505	54°45'N	166°57'W	Pd	3	6	8	5
6	11	1440	53°23'N	168°35'W	Pd	4	2	2	5.5
		1520	56°45'N	168°50'W	Pd	1	2	2	5.5
		1630	56°14'N	169°08'W	Pd	6	2	2	5.5
		2015	56°05'N	170°11'W	Pd	2	2	2	5.5
		2210	56°04'N	170°44'W	Cu	1	2	2	5.4
6	12	0550	55°58'N	172°54'W	Pd	10	2	2	6
		0643	55°58'N	173°11'W	Pd	2	2	2	6
		0930	55°56'N	173°58'W	Pd	1	7	3	6
		0940	55°56'N	174°00'W	Pd	3	3	7	6
		1005	55°56'N	174°07'W	Pd	4	3	7	6
		1009			Pd	11	3	8	5.9
		1016	55°55'N	174°11'W	Pd	12	3	8	5.9
		1035	55°55'N	174°16'W	Pd	15	3	8	5.9
		1125	55°55'N	174°25'W	Pd	5	3	8	5.9
		1250	55°54'N	174°37'W	Pd	3	3		5.9
6	14	0730	55°27'N	179°52'E	Pd	5	3		5
		0755	55°25'N	179°38'E	Pd	4	3		5
		0840	55°24'N	173°33'E	Pd	7-10	2		5
		0920	55°22'N	179°15'E	Cu	1	2		5.2
		1452	55°10'N	177°44'E	Pd	4	0		5.4
		1648	55°08'N	177°21'E	Ej	1			5.4
		1819	55°03'N	176°04'E	Pd	1	1		5.4
		1922	55°01'N	176°28'E	Cu	1	1		5.4
		1942	54°59'N	176°19'E	Pd	3	1		5.4
6	15		54°34'N	173°28'E	Pd	3	1	3	5.8
		0825	54°28'N	172°53'E	Pd	3	1	2	5.8
		0840	54°27'N	172°47'E	Pd	7	1	2	5.8
		0855	54°26'N	172°43'E	Ba	1	1		5.8
		0933	54°25'N	172°36'E	Pd	5	1		5.8
		0940	54°25'N	172°30'E	Pd	2	1		5.8
		1010	54°24'N	172°22'E	Pd	3	1		5.8
		1025	54°23'N	172°19'E	Pd	3	1		5.8
		1044	54°22'N	172°12'E	Pd	3	2		6
		1125	54°21'N	172°06'E	Pd	6	2		6
		1140	54°21'N	172°06'E	Pd	10	2		6
		1200	54°19'N	171°53'E	Pd	2	2		6
		1310	54°15'N	171°31'E	Pd	3	2		6

Appendix Table 6.--Pelagic sightings of other marine mammals during summer 1989 Rubezhnoe cruise (continued).

Date		Time	Location Lat.	Location Long.	Spec.*	No.	Sea State	Wind m/s	Water temp.
6	15	1430	54°09'N	171°09'E	Pd	3	2		6
		1440	54°09'N	171°06'E	Pd	4	2		6
		1500	54°08'N	171°02'E	Cu	1	2		6
		1518	54°08'N	171°05'E	Pd	4	2		6
		1610	54°03'N	170°42'E	Pd	6	2		6
		1707	54°02'N	170°35'E	Pd	2	2		6
		1713	54°02'N	170°35'E	Cu	1	2		6
		1720	54°00'N	170°10'E	Pd	2	2		5.8
		2135	53°47'N	169°19'E	Pd	1	2		5
		2145	53°04'N	166°19'E	Pd	3	2		5
6	16	0914	53°04'N	166°19'E	Pd	2	1		5
		1125	52°56'N	165°48'E	Pd	6	1		5
		1330	52°48'N	165°15'E	Pd	2	3		6.1
		1400	52°46'N	165°06'E	Pd	5	3		6.1
		1440	52°46'N	165°06'E	Cu	1	3		6.1
		1457	52°44'N	164°56'E	Pd	5	3		6.1
		1510	52°43'N	164°53'E	Pd	4	3		6.1
		1558	52°41'N	164°40'E	Pd	10	3		6.1
		1653	52°37'N	164°30'E	Pd	6	1		6.1
		1717	52°35'N	164°21'E	Pd	18	1		6.1
		1818	52°32'N	164°11'E	Pd	27	1		6.1
6	17	0815	51°38'N	160°45'E	Pd	6	2		4.8
		1207	51°27'N	160°13'E	Pd	11	2		4.8
		1212	51°21'N	160°50'E	Pd	10	2		4.8
6	18	0740	49°40'N	155°23'E	Pd	8	2		3.8
		0910	49°28'N	155°11'E	Pd	13	2		3.8
		0930	49°25'N	155°03'E	Pd	9	2		3.8
		1248	49°01'N	154°31'E	Ba	1	2		1.4
6	19	1355	48°52'N	154°28'E	Pd	3	2		1.4
		1748	48°50'N	154°13'E	Oo	4	2		1.4
6	20	0640	48°32'N	153°50'E	Oo	1	1		1.6
6	21	2300	47°56'N	152°56'E	Oo	1	1		2.2
6	24	0700	46°40'N	151°25'E	Pd	2	1		3.2
6	28	1210	46°52'N	151°50'E	Pd	3			3
7	02	1000	44°37'N	147°00'E	Oo	8			2.2
		1712	47°10'N	152°21'E	Oo	3	3		2.2
7	03	1430	47°02'N	152°10'E	Cu	1	2		2
7	04	2055	47°28'N	152°41'E	Oo	5	2		2.4
7	07	0830	48°42'N	154°00'E	Oo	1	0	0	2.6
		0915	48°42'N	153°54'E	El	1	0	0	2
		1812	48°52'N	154°12'E	Ba	4			2

Appendix Table 6.--Pelagic sightings of other marine mammals during summer 1989 Rubezhnoe cruise (continued).

Date		Time	Location		Spec.*	No.	Sea State	Wind m/s	Water temp.
			Lat.	Long.					
7	09	0918	48°52'N	154°12'E	Ba	2			
		2103	48°47'N	154°02'E	Oo	1			
7	10	0752	49°43'N	159°40'E	Pd	2	2		2
		1030	49°50'N	154°50'E	Cu	1	2		2
		2325	49°39'N	154°51'E	Pd	7	2		1.9
7	11	1020	49°51'N	154°55'E	Pd	5	3		6.4
		1300	50°08'N	155°05'E	Oo	3			
		1310	50°09'N	155°06'E	Oo	5			
		1410	50°19'N	155°09'E	Pd	6			
		1453	50°27'N	155°13'E	Pd	2	2		5.6
7	12	0840	50°49'N	156°17'E	Ba	2	2		5.1
		0955	50°51'N	156°18'E	Pd	2	2		5.1
		1525	50°55'N	157°32'E	Pf	1	2		6.6
		1525	50°55'N	157°32'E	Cu	1	2		6.6
		1528	50°55'N	157°32'E	Pd	3	2		6.6
		1528	50°55'N	157°32'E	Cu	1	2		6.6
		1528	50°56'N	157°32'E	Pd	2	1		6.6
		1724	50°50'N	157°58'E	Pd	5	1		6
7	13	0830	52°21'N	158°33'E	Pd	4	1		6
		1445	52°24'N	158°30'E	Pd	3			10.8
		1630	52°20'N	158°30'E	Pd	2	1		10.8
		1815	52°23'N	159°36'E	Pd	7	1		12
			52°21'N	160°16'E	Oo	4-5	1		
7	14	1155	52°09'N	164°00'E	Pd	2	2		9.2
		2020	52°03'N	166°10'E	Pd	2	2		9.2
		2055	52°03'N	166°16'E	Pd	8	2		9.2
		2140	53°02'N	166°32'E	Cu	1	2		9.2
		2330	52°01'N	167°00'E	Cu	1	2		9.2
7	15	1325	51°54'N	170°41'E	Pd	1	1		8.6
		1338	51°52'N	170°44'E	Pd	2	1		8.6
		1340	51°51'N	170°45'E	Pd	1	1		8.6
		1345	51°54'N	170°46'E	Cu	1	1		9.2
		1416	51°51'N	170°54'E	Pd	4	1		9.2
		1425	51°51'N	170°55'E	Cu	1	1		9.2
		1829	51°59'N	171°58'E	Cu	1	1		8.6
		2230	51°45'N	173°07'E	Pd	1	1		8.8
7	16	0830	51°39'N	175°25'E	Pd	3	2		6.0
		0937	51°39'N	175°40'E	Oo	3	2		6.0
		1347	51°48'N	176°46'E	Pm	3	2		6.0
		1353	51°49'N	176°42'E	Pm	1	2		7.7
		1454	51°52'N	176°37'E	Oo	1	2		7.3
		1550	51°56'N	177°20'E	Oo	2	2		7.3

Appendix Table 6.--Pelagic sightings of other marine mammals during summer 1989 Rubezhnoe cruise (continued).

Date		Time	Location		Spec.*	No.	Sea State	Wind m/s	Water temp.
			Lat.	Long.					
7	16	1633	51°59'N	177°25'E	Pd	10	2		2.4
		2315	52°15'N	178°21'E	Pd	4	4		2.4
7	17	1628	52°29'N	177°28'E	Pd	3	3		2.4
		1817	52°33'N	176°58'E	Pd	4	3		2.4
		1900	52°33'N	176°43'E	Cu	1	3		7.4
		1937	52°34'N	176°35'E	Pd	4	3		7.4
		2200	52°36'N	176°09'E	Pd	2	3		7.4
7	18	0940			Pd	1	3		7.6
		1800	52°23'N	172°28'W	El	3	1		8.1
7	19	1400	52°13'N	172°33'W	Oo	1	2		5.0
		1749	52°16'N	172°25'W	Pd	5	2		5.0
7	21	1621	52°30'N	172°09'W	Bm	4	1		7.0
		1654	52°34'N	171°54'W	Bm	10	1		7.0
		1905	52°55'N	171°22'W	Pd	12	1		6.6
		1944	52°58'N	171°12'W	Pd	3	1		6.6
		2010	53°00'N	171°06'W	Pd	8	1		6.6
		2050	53°03'N	170°58'W	Ej	1	1		6.6
		2115	53°05'N	170°50'W	Pd	1	1		6.6
		2120	53°06'N	170°48'W	Cu	1	1		6.6
		2300	53°12'N	170°26'W	Pd	6	1		9.8
		2330	53°14'N	170°10'W	Pd	4	1		9.8

*Species codes:

Ba - Balaenoptera acutorostrata
Cu - Callorhinus ursinus
Ej - Eumetopias jubatus
El - Enhydra lutris
Ma - Megaptera novaeangliae
Oo - Orcinus orca
Pd - Phocoenoides dalli
Pm - Physeter macrocephalus
Pf - Phoca fasciata